

VI. CLAIMS

1. A liquid dispenser apparatus comprising:

5 a collapsible molded reservoir;
a compressible metering chamber fluidly connected to said collapsible molded reservoir with a liquid introduction element;
a liquid flow deflection element;
10 an inlet unidirectional valve which connects said liquid introduction element to a metering chamber;
a flexible diaphragm capable of substantial conformation to at least part of said metering chamber;
a plunger configured to horizontally displace said flexible diaphragm; and
15 a liquid exit element connected to said metering chamber having an outlet unidirectional valve.

2. A liquid dispenser apparatus comprising:

a liquid reservoir;
a compressible metering chamber fluidly connected to said liquid reservoir with a liquid 20 introduction element;
a liquid flow deflection element;
an inlet unidirectional valve which connects said liquid introduction element to said compressible metering chamber;
a plunger configured to horizontally displace at least part of said compressible metering 25 chamber; and
a liquid exit element connected to said metering chamber having an outlet unidirectional valve.

3. A liquid dispenser apparatus according to claim 2 wherein said inlet

30 unidirectional valve is located on a side of said metering chamber.

4. A liquid dispenser apparatus according to claim 2 said liquid flow deflection element comprises a vertical flow element below said reservoir and a horizontal flow element next to said metering chamber.

5 5. A liquid dispenser apparatus according to claim 4 and further comprising a vertical flow element below said metering chamber.

6. A liquid dispenser apparatus according to claim 2 wherein said compressible metering chamber comprises a flexible diaphragm.

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7. A liquid dispenser apparatus comprising:

a liquid reservoir;

a metering chamber fluidly connected to said liquid reservoir with a liquid introduction element;

15 an inlet unidirectional valve which connects said liquid introduction element to a metering chamber;

a flexible diaphragm capable of substantial conformation to at least part of said metering chamber;

a plunger configured to compress and decompress said flexible diaphragm; and

20 a liquid exit element connected to said metering chamber having an outlet unidirectional valve.

8. A liquid dispenser apparatus according to claim 7 wherein said flexible diaphragm comprises a one piece diaphragm.

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9. A liquid dispenser apparatus according to claim 7 wherein said flexible diaphragm comprises a polyolefin material.

10. A liquid dispenser apparatus according to claim 7 wherein said flexible 30 diaphragm capable of substantial conformation to at least part of said metering chamber comprises a flexible diaphragm capable of substantial conformation to a wall of said metering chamber.

11. A liquid dispenser apparatus comprising:
a collapsible molded reservoir;
a compressible metering chamber fluidly connected to said liquid reservoir with a liquid introduction element;
5 an inlet unidirectional valve which connects said liquid introduction element to said compressible metering chamber;
a plunger configured to displace at least part of said compressible metering chamber; and
a liquid exit element connected to said metering chamber having an outlet unidirectional valve.

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12. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 wherein said reservoir comprises a one piece structure.

13. A liquid dispenser apparatus according to claim 11 wherein said collapsible 15 molded reservoir comprises a structured bottle.

14. A liquid dispenser apparatus according to claim 11 and further comprising a reservoir collapse force less than a force required to uncompress said metering chamber.

20 15. A liquid dispenser apparatus according to claim 11 wherein said reservoir comprises an interchangeable reservoir.

16. A liquid dispenser apparatus according to claim 11 wherein said reservoir comprises a refillable reservoir.

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17. A liquid dispenser apparatus according to claim 7 or 11 and further comprising a liquid flow deflection element.

30 18. A liquid dispenser apparatus according to claim 17 wherein said inlet unidirectional valve is located on a side of said metering chamber.

19. A liquid dispenser apparatus according to claim 17 wherein said liquid flow deflection element comprises a vertical flow element below said reservoir and a horizontal flow element next to said metering chamber.

5 20. A liquid dispenser apparatus according to claim 19 and further comprising a vertical flow element below said metering chamber.

21. A liquid dispenser apparatus according to claim 1 wherein said inlet unidirectional valve is located on a side of said metering chamber.

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22. A liquid dispenser apparatus according to claim 1 wherein said liquid flow deflection element comprises a vertical flow element below said reservoir and a horizontal flow element next to said metering chamber.

15 23. A liquid dispenser apparatus according to claim 22 and further comprising a vertical flow element below said metering chamber.

24. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 and further comprising a dual clamp element.

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25. A liquid dispenser apparatus according to claim 24 wherein said dual clamp element connects said liquid reservoir to said metering chamber and wherein said dual clamp connects said connected reservoir and metering chamber to an automated system.

25 26. A liquid dispenser apparatus according to claim 24 wherein said dual clamp element comprises a left clamp and right clamp.

27. A liquid dispenser apparatus according to claim 24 wherein said dual clamp element comprises an automated system attachment.

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28. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 and further comprising a biological sample located directly below said liquid exit element.

29. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 and further comprising an automated biological staining device.

5 30. A liquid dispenser apparatus according to claim 29 wherein said automated biological staining device comprises a biological stain selected from a group consisting of a immunohistochemical staining device, special stains staining device, and an in situ hybridization device.

10 31. A liquid dispenser apparatus according to claim 11 wherein said compressible metering chamber comprises a flexible diaphragm.

32. A liquid dispenser apparatus according to claim 1 or 7 and further comprising an internal diaphragm compressor.

15 33. A liquid dispenser apparatus according to claim 6 or 31 and further comprising an internal diaphragm compressor.

34. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 wherein said metering chamber comprises a repeatable liquid measurement element.

20 35. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 wherein said metering chamber comprises a liquid measurement amount of about 250 micro liters.

25 36. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 and further comprising an internal mechanical stop located in said metering chamber to stop displacement of said metering chamber at an uncompressed position.

30 37. A liquid dispenser apparatus according to claim 1, 6, 7 or 31 wherein said flexible diaphragm comprises an uncompressed position and a compressed position.

38. A liquid dispenser apparatus according to claim 1, 6, 7 or 31 wherein said flexible diaphragm comprises a plastic molded diaphragm.

39. A liquid dispenser apparatus according to claim 1, 6, 7 or 31 wherein said flexible diaphragm comprises a flexible membrane.

40. A liquid dispenser apparatus according to claim 1, 6, 7 or 31 wherein said flexible diaphragm comprises a chemically resistant material.

41. A liquid dispenser apparatus according to claim 1, 6, 7 or 31 wherein said flexible diaphragm comprises a polyolefin material.

10 42. A liquid dispenser apparatus according to claim 1, 6, 7 or 31 wherein said flexible diaphragm comprises a one piece diaphragm.

15 43. A liquid dispenser apparatus according to claim 37 wherein said compressed position comprises said diaphragm substantially conformed to a shape of at least part of said metering chamber.

44. A liquid dispenser apparatus according to claim 2 or 11 and further comprising a plunger to which said compressible metering chamber is responsive.

20 45. A liquid dispenser apparatus according to claim 1 or 7 and further comprising an actuator to which said plunger and said flexible diaphragm is responsive.

25 46. A liquid dispenser apparatus according to claim 2 or 11 and further comprising an actuator to which said plunger and said compressible metering chamber is responsive

47. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 and further comprising a compression element and a uncompression element.

30 48. A liquid dispenser apparatus according to claim 47 wherein said uncompression element comprises a spring.

49. A liquid dispenser apparatus according to claim 47 wherein said compression element comprises a manual compression element.

50. A liquid dispenser apparatus according to claim 47 wherein said compression element comprises an automatic compression element.

5 51. A liquid dispenser apparatus according to claim 50 wherein said automatic compression element comprises compression selected from a group consisting of a stepper/servor control, a motor and an air cylinder.

10 52. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 wherein said outlet unidirectional valve comprises:

a valve disk;
a valve retainer; and
a valve membrane.

15 53. A liquid dispenser apparatus according to claim 52 wherein said valve disk comprises a seal surface and a flow director.

54. A liquid dispenser apparatus according to claim 52 wherein said valve membrane comprises flexible membrane.

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55. A liquid dispenser apparatus according to claim 52 wherein said valve disk comprises conical disk.

25 56. A liquid dispenser apparatus according to claim 52 wherein said valve disk and membrane comprises a seal.

57. A liquid dispenser apparatus according to claim 56 wherein said seal comprises a positive fluid seal.

30 58. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 wherein said outlet unidirectional valve comprises an open position and a closed position.

59. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 and further comprising a seal between said reservoir and said liquid introduction element.

5 60. A liquid dispenser apparatus according to claim 59 wherein said seal is selected from a group consisting of a radial o-ring and flange o-ring.

61. A liquid dispenser apparatus according to claim 2 or 7 wherein said reservoir comprises a collapsible molded reservoir.

10 62. A liquid dispenser apparatus according to claim 61 wherein said collapsible molded reservoir comprises a structured bottle.

63. A liquid dispenser apparatus according to claim 1 wherein said collapsible molded reservoir comprises a structured bottle.

15 64. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 wherein said reservoir comprises a chemically compatible material.

20 65. A liquid dispenser apparatus according to claim 64 wherein said chemically compatible material is selected from a group consisting of polyolefin, inert materials and elastic materials.

66. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 and further comprising reservoir housing around said reservoir.

25 67. A liquid dispenser apparatus according to claim 66 wherein said reservoir housing comprises a left and right housing element.

30 68. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 wherein said liquid exit element comprises a narrow channel between said metering chamber and said outlet unidirectional valve.

69. A liquid dispenser apparatus according to claim 7 wherein said reservoir comprises a collapsible molded reservoir and further comprising a reservoir collapse force less than a force required to uncompress said diaphragm.

5 70. A liquid dispenser apparatus according to claim 1 and further comprising a reservoir collapse force less than a force required to uncompress said diaphragm.

10 71. A liquid dispenser apparatus according to claim 2 wherein said reservoir comprises a collapsible molded reservoir and further comprising a reservoir collapse force less than a force required to uncompress said metering chamber.

72. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 wherein said reservoir is located above said metering chamber.

15 73. A liquid dispenser apparatus according to claim 1, 2 or 7 wherein said reservoir comprises an interchangeable reservoir.

74. A liquid dispenser apparatus according to claim 1, 2 or 7 wherein said reservoir comprises a refillable reservoir.

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75. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 and further comprising a reduced friction dispenser.

25 76. A liquid dispenser apparatus according to claim 75 wherein said reduced friction dispenser comprises minimal sliding parts.

77. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 and further comprising a sealed system.

30 78. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 and further comprising a self priming element.

79. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 and further comprising a tip-down priming element.

5 80. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 and further comprising a shipping lock.

81. A liquid dispenser apparatus according to claim 80 wherein said shipping lock comprises a diaphragm held in a compressed position to prevent liquid flow from said reservoir and said liquid introduction element.

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82. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 wherein said liquid introduction element comprises a channel between said reservoir and said inlet unidirectional valve.

15 83. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 wherein said inlet unidirectional valve comprises at least one liquid flow opening and a membrane.

84. A liquid dispenser apparatus according to claim 83 wherein said membrane comprises a seal.

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85. A liquid dispenser apparatus according to claim 84 wherein said seal comprises a positive seal.

25 86. A liquid dispenser apparatus according to claim 1, 2, 7 or 11 wherein said inlet unidirectional valve comprises an open position and a closed position.

87. A liquid dispenser apparatus according to claim 7 wherein said plunger is configured to horizontally displace said diaphragm.

30 88. A liquid dispenser apparatus according to claim 11 wherein said plunger configured to displace at least part of said compressible metering chamber comprises a plunger configured to horizontally displace at least part of said metering chamber.

89. A liquid dispenser apparatus according to claim 1, 2, 87 or 88 wherein said plunger configured to horizontally displace comprises a substantially vertical diaphragm capable of moving in a horizontal direction.

5 90. A method of dispensing liquid comprising the steps of:
establishing liquid in a collapsible molded reservoir;
providing a metering chamber having a flexible diaphragm;
horizontally displacing said flexible diaphragm from a compressed position to an
uncompressed position;
10 creating a vacuum in said metering chamber;
opening an inlet unidirectional valve which allows liquid to flow from said reservoir to
said metering chamber;
deflectingly flowing an amount of liquid from said reservoir to said metering chamber
through said inlet unidirectional valve;
15 at least partially collapsing said molded reservoir with said vacuum;
substantially maintaining structure of said reservoir;
horizontally displacing said flexible diaphragm from said uncompressed position to said
compressed position;
closing said inlet unidirectional valve;
20 opening an outlet unidirectional valve;
substantially conforming said diaphragm against a wall of said metering chamber;
distributing said amount of liquid from said metering chamber through said outlet
unidirectional valve; and
closing said outlet unidirectional valve.

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91. A method of dispensing liquid comprising the steps of:
establishing liquid in a reservoir;
providing a compressible metering chamber;
horizontally displacing at least part of said compressible metering chamber from a
30 compressed position to an uncompressed position;
opening an inlet unidirectional valve which allows liquid to flow from said reservoir to
said metering chamber;

deflectingly flowing an amount of liquid from said reservoir to said metering chamber through said inlet unidirectional valve;

horizontally displacing at least part of said compressible metering chamber from said uncompressed position to said compressed position;

5 closing said inlet unidirectional valve;

opening an outlet unidirectional valve;

distributing said amount of liquid from said metering chamber through said outlet unidirectional valve; and

closing said outlet unidirectional valve.

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92. A method of dispensing liquid according to claim 91 and further comprising the step of locating said inlet unidirectional valve on a side of said metering chamber.

93. A method of dispensing liquid according to claim 91 wherein said step of deflectingly flowing an amount of liquid from said reservoir to said metering chamber through said inlet unidirectional valve comprises the step of vertically flowing said liquid out of said reservoir and horizontally flowing said liquid into said metering chamber.

94. A method of dispensing liquid according to claim 93 and further comprising the step of vertically flowing said liquid out of said metering chamber.

95. A method of dispensing liquid according to claim 91 wherein said step of horizontally displacing at least part of said compressible metering chamber from said uncompressed position to said compressed position comprises the step of horizontally displacing a flexible diaphragm from an uncompressed position to a compressed position.

96. A method of dispensing liquid comprising the steps of:
establishing liquid in a reservoir;

30 providing a metering chamber having a flexible diaphragm;
displacing said flexible diaphragm from a compressed position to an uncompressed position;

opening an inlet unidirectional valve which allows liquid to flow from said reservoir to said metering chamber;

flowing an amount of liquid from said reservoir to said metering chamber through said inlet unidirectional valve;

- 5 displacing said uncompressed diaphragm to a compressed position;
- closing said inlet unidirectional valve;
- opening an outlet unidirectional valve;
- substantially conforming said diaphragm against at least part of said metering chamber;
- 10 distributing said amount of liquid from said metering chamber through said outlet unidirectional valve; and
- closing said liquid output unidirectional valve.

97. A method of dispensing liquid according to claim 96 wherein said step of providing a metering chamber having a flexible diaphragm comprises the step of 15 providing a metering chamber having a single piece flexible diaphragm.

98. A method of dispensing liquid according to claim 96 wherein said step of providing a metering chamber having a flexible diaphragm comprises the step of providing a polyolefin flexible diaphragm.

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99. A method of dispensing liquid comprising the steps of establishing liquid in a collapsible molded reservoir;

providing a compressible metering chamber;

displacing at least part of said metering chamber from a compressed position to an 25 uncompressed position;

opening an inlet unidirectional valve which allows liquid to flow from said reservoir to said metering chamber;

creating a vacuum in said metering chamber;

flowing an amount of liquid from said reservoir to said metering chamber through said 30 inlet unidirectional valve;

at least partially collapsing said molded reservoir with said vacuum;

substantially maintaining structure of said molded reservoir;

displacing at least part of said metering chamber from said uncompressed position to said compressed position;

closing said inlet unidirectional valve;

opening an outlet unidirectional valve;

5 distributing said amount of liquid from said metering chamber through said outlet unidirectional valve; and
closing said outlet unidirectional valve.

100. A method of dispensing liquid according to claim 90, 91, 96 or 99 wherein said 10 step of establishing liquid in a reservoir comprises the step of establishing liquid in a single piece collapsible molded reservoir.

101. A method of dispensing liquid according to claim 99 wherein said step of establishing liquid in a collapsible molded reservoir comprises the step of establishing 15 liquid in a structured collapsible molded reservoir.

102. A method of dispensing liquid according to claim 99 and further comprising the step of at least partially collapsing said collapsible molded reservoir with a force less than a force required to uncompress said metering chamber.

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103. A method of dispensing liquid according to claim 99 and further comprising the step of interchanging said collapsible molded reservoir.

104. A method of dispensing liquid according to claim 99 and further comprising the 25 step of refilling said collapsible molded reservoir.

105. A method of dispensing liquid according to claim 99 and further comprising the step of balancing collapsibility of said collapsible molded reservoir with durability of said collapsible molded reservoir.

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106. A method of dispensing liquid according to claim 96 or 99 and further comprising deflectingly flowing an amount of liquid from said reservoir to said metering chamber through said inlet unidirectional valve.

107. A method of dispensing liquid according to claim 106 and further comprising locating said inlet unidirectional valve on a side of said metering chamber.

5 108. A method of dispensing liquid according to claim 106 wherein said step of deflectingly flowing an amount of liquid from said reservoir to said metering chamber through said inlet unidirectional valve comprises the step of vertically flowing said liquid out of said reservoir and horizontally flowing said liquid into said metering chamber.

10 109. A method of dispensing liquid according to claim 108 and further comprising vertically flowing said liquid out of said metering chamber.

110. A method of dispensing liquid according to claim 90 and further comprising locating said inlet unidirectional valve on a side of said metering chamber

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111. A method of dispensing liquid according to claim 90 wherein said step of deflectingly flowing an amount of liquid from said reservoir to said metering chamber through said inlet unidirectional valve comprises the step of vertically flowing said liquid out of said reservoir and horizontally flowing said liquid into said metering chamber.

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112. A method of dispensing liquid according to claim 111 and further comprising the step of vertically flowing said liquid out of said metering chamber.

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113. A method of dispensing liquid according to claim 90, 91, 96 or 99 and further comprising the step of clamping said reservoir to said metering chamber.

114. A method of dispensing liquid according to claim 113 and further comprising the step of attaching said reservoir and said metering chamber to an automated system.

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115. A method of dispensing liquid according to claim 113 wherein said step of clamping said reservoir to said metering chamber comprises the step of clamping said reservoir to said metering chamber with a left clamp and a right clamp.

116. A method of dispensing liquid according to claim 90, 91, 96 or 99 and further comprising the step of staining a biological sample with said distributed amount of liquid.

5 117. A method of dispensing liquid according to claim 116 wherein said step of staining a biological sample with said distributed amount of liquid comprises the step of selecting a staining method from a group consisting of special stains, immunohistochemical stains, and in Situ Hybridization.

10 118. A method of dispensing liquid according to claim 117 and further comprising the step of automating said staining method.

15 119. A method of dispensing liquid according to claim 99 wherein said step of providing said compressible metering chamber comprises the step of providing a metering chamber having a flexible diaphragm.

120. A method of dispensing liquid according to claim 95 or 119 and further comprising the step of substantially conforming said diaphragm against at least part of said metering chamber.

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121. A method of dispensing liquid according to claim 120 wherein said step of substantially conforming said diaphragm against at least part of said metering chamber comprises the step of substantially conforming said diaphragm against a wall of said metering chamber.

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122. A method of dispensing liquid according to claim 90 or 96 and further comprising the step of internally compressing said diaphragm.

30 123. A method of dispensing liquid according to claim 95 or 119 and further comprising the step of internally compressing said diaphragm.

124. A method of dispensing liquid according to claim 90, 91, 96 or 99 and further comprising repeatedly measuring an amount of liquid in said metering chamber.

125. A method of dispensing liquid according to claim 90, 91, 96 or 99 wherein said step of distributing said amount of liquid comprises the step of distributing about 250 micro liters of said liquid.

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126. A method of dispensing liquid according to claim 90, 91, 96 or 99 and further comprising the step of stopping said diaphragm in said metering chamber at an internal mechanical stop.

10 127. A method of dispensing liquid according to claim 90, 95, 96 or 119 wherein said step of providing a metering chamber having a flexible diaphragm comprises the step of providing a plastic molded diaphragm.

15 128. A method of dispensing liquid according to claim 90, 95, 96 or 119 wherein said step of providing a metering chamber having a flexible diaphragm comprises the step of providing a metering chamber having a flexible membrane.

20 129. A method of dispensing liquid according to claim 90, 95, 96 or 119 wherein said step of providing a metering chamber having a flexible diaphragm comprises the step of providing a chemically resistant diaphragm.

25 130. A method of dispensing liquid according to claim 90, 95 or 119 wherein said step of providing a metering chamber having a flexible diaphragm comprises the step of providing a polyolefin flexible diaphragm.

131. A method of dispensing liquid according to claim 90, 95 or 119 wherein said step of providing a metering chamber having a flexible diaphragm comprises the step of providing a metering chamber having a single piece flexible diaphragm.

30 132. A method of dispensing liquid according to claim 90 wherein said step of horizontally displacing said flexible diaphragm from a compressed position to an uncompressed position comprises the step of horizontally displacing said flexible diaphragm from a compressed position to an uncompressed position with a spring.

133. A method of dispensing liquid according to claim 91 wherein said step of horizontally displacing said at least part of said compressible metering chamber from a compressed position to an uncompressed position comprises the step of horizontally displacing said at least part of said compressible metering chamber from a compressed position to an uncompressed position with a spring.

134. A method of dispensing liquid according to claim 96 wherein said step of displacing said flexible diaphragm from a compressed position to an uncompressed position comprises the step of displacing said flexible diaphragm from a compressed position to an uncompressed position with a spring.

135. A method of dispensing liquid according to claim 99 wherein said step of displacing at least part of said compressible metering chamber from a compressed position to an uncompressed position comprises the step of displacing at least part of said compressible metering chamber from a compressed position to an uncompressed position with a spring.

136. A method of dispensing liquid according to claim 90 or 96 and further comprising manually compressing said flexible diaphragm.

137. A method of dispensing liquid according to claim 91 or 99 and further comprising manually compressing said compressible metering chamber.

138. A method of dispensing liquid according to claim 90 or 96 and further comprising automatically compressing said flexible diaphragm.

139. A method of dispensing liquid according to claim 91 or 99 and further comprising automatically compressing said compressible metering chamber.

140. A method of dispensing liquid according to claim 138 wherein said step of automatically compressing said flexible diaphragm comprises the step of compressing

with an a compression element selected from a group consisting of a stepper/servo control, a motor and an air cylinder.

141. A method of dispensing liquid according to claim 139 wherein said step of
5 automatically compressing said flexible diaphragm comprises the step of compressing
with an a compression element selected from a group consisting of a stepper/servo
control, a motor and an air cylinder.

142. A method of dispensing liquid according to claim 90, 91, 96 or 99 and further
10 comprising the step of directing liquid flow through said outlet unidirectional valve.

143. A method of dispensing liquid according to claim 90, 91, 96 or 99 and further
comprising the step of sealingly attaching said outlet unidirectional valve to said
metering chamber.

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144. A method of dispensing liquid according to claim 143 wherein said step of
sealingly attaching said outlet unidirectional valve to said metering chamber comprises
the step of positively sealingly attaching said outlet unidirectional valve to said metering
chamber.

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145. A method of dispensing liquid according to claim 90, 91, 96 or 99 and further
comprising the step of sealingly attaching said reservoir to said metering chamber.

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146. A method of dispensing liquid according to claim 145 wherein said step of
sealingly attaching said reservoir to said metering chamber comprises the step of
selecting a seal from a group consisting of a radial o-ring and a flange o-ring.

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147. A method of dispensing liquid according to claim 91 or 96 wherein said step of
establishing liquid in a reservoir comprises the step of establishing liquid in a collapsible
molded reservoir.

148. A method of dispensing liquid according to claim 90, 91, 96 or 99 wherein said step of establishing liquid in said reservoir comprises the step of providing a chemically compatible reservoir.

5 149. A method of dispensing liquid according to claim 148 wherein said chemically compatible reservoir has a material selected from a group consisting of polyolefin, inert materials and elastic materials.

10 150. A method of dispensing liquid according to claim 90, 91, 96 or 99 and further comprising attaching reservoir housing around said reservoir.

151. A method of dispensing liquid according to claim 150 wherein said step of attaching said reservoir housing around said reservoir comprises the step of attaching a left housing element and right housing element.

15 152. A method of dispensing liquid according to claim 91 or 96 and further comprising the step of creating a vacuum.

20 153. A method of dispensing liquid according to claim 152 and further comprising the step of at least partially collapsing said reservoir with a force less than a force required to uncompress said metering chamber.

25 154. A method of dispensing liquid according to claim 90 and further comprising the step of at least partially collapsing said collapsible molded reservoir with a force less than a force required to uncompress said diaphragm.

155. A method of dispensing liquid according to claim 90 or 147 and further comprising the step of balancing collapsibility of said collapsible molded reservoir with durability of said collapsible molded reservoir.

30 156. A method of dispensing liquid according to claim 90, 91, 96 or 99 and further comprising the step of locating said reservoir above said metering chamber.

157. A method of dispensing liquid according to claim 90, 91 or 96 and further comprising the step of interchanging said reservoir.

5 158. A method of dispensing liquid according to claim 90, 91 or 96 and further comprising the step of refilling said reservoir.

159. A method of dispensing liquid according to claim 90, 91, 96 or 99 and further comprising the step of utilizing minimally sliding parts in said dispensing system.

10 160. A method of dispensing liquid according to claim 90, 91, 96 or 99 and further comprising the step of self priming said metering chamber.

161. A method of dispensing liquid according to claim 90, 91, 96 or 99 and further comprising the step of tip-down priming said metering chamber.

15 162. A method of dispensing liquid according to claim 90, 91, 96 or 99 and further comprising the step of locking said metering chamber to prevent liquid from flowing from said reservoir.

20 163. A method of dispensing liquid according to claim 162 wherein said step of locking said metering chamber to prevent liquid from flowing from said reservoir comprises the step of holding a diaphragm in a compressed position.

25 164. A method of dispensing liquid according to claim 90, 91, 96 or 99 wherein said step of flowing an amount of liquid from said reservoir to said metering chamber through said inlet unidirectional valve comprises the step of flowing said amount of liquid through at least one liquid flow opening and a membrane of said inlet unidirectional valve.

30 165. A method of dispensing liquid according to claim 164 and further comprising the step of creating a seal when said inlet valve is closed.

166. A method of dispensing liquid according to claim 96 wherein said step of displacing said flexible diaphragm from a compressed position to an uncompressed position comprises the step of horizontally displacing said flexible diaphragm from a compressed position to an uncompressed position.

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167. A method of dispensing liquid according to claim 99 wherein said step of displacing at least part of said compressible metering chamber from a compressed position to an uncompressed position comprises the step of horizontally displacing at least part of said compressible metering chamber from a compressed position to an 10 uncompressed position.

168. A method of dispensing liquid according to claim 91 or 167 wherein said step of horizontally displacing at least part of said compressible metering chamber from a compressed position to an uncompressed position comprises the step of moving a 15 substantially vertical diaphragm in a horizontal direction.

169. A method of dispensing liquid according to claim 90 or 166 wherein said step of horizontally displacing said flexible diaphragm from a compressed position to an uncompressed position comprises the step of moving a substantially vertical diaphragm 20 in a horizontal direction.